
Space Weather Forecast

Issued on Sunday 5 January 2025 at 00:24 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Moderate class flares expected, with an increased chance of Strong class flares. Chance G1 Minor Geomagnetic Storms Days 1 (05 Jan).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity increased to High levels with a Strong flare observed at 04/1248UTC from sunspot AR3947 in the northeast disk. This region also looks responsible for two Moderate flares in the past 24 hours.

There are fifteen sunspot regions on the Earth-facing disc, with three unnumbered regions. Despite the large number of spots on the Earth facing-disc, many are small and generally magnetically simple. A complex spot in the northeast is the largest spot and has been responsible for the bulk of recent activity, with three lower X-class flares now recorded since appearing over the eastern limb. Another spot in the centre-east shows some magnetic complexity and has seen some growth in its intermediate spots in recent hours. Some slight decay of AR3939 and AR3945 has taken place, otherwise there has been little change to the remaining regions on the Earth facing-disc.

No Earth-directed CMEs were observed during the period, though 2 CMEs visible on Lasco C3 imagery off the west limb are to be analysed.

Solar Wind / Geomagnetic Activity: Solar winds, as observed by ACE at L1, started the period around 420km/s, but steadily increased through the day, likely due initially to a CME arrival around 04/0200UTC and then a connection with a coronal hole fast wind, to a strong 690km/s. Density was predominantly at average to below average levels. The Interplanetary Magnetic Field, Bt, started moderate, peaking at a strong 17.8nT around 04/1143 UTC, before easing back to weak levels later. The north-south component, Bz, fluctuated between negative and positive through much of the period.

Geomagnetic activity was at Quiet levels until 04/0300 UTC. Then became mostly Active (Kp4) for the remainder of the period, with G1/Minor geomagnetic storm conditions recorded between 04/0300-0900 UTC and 04/1800-2100 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background levels until 04/2305UTC when an S1 Minor Solar Radiation Storm was observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Activity is forecast to be Moderate to High, with further Moderate flares expected and a chance of further isolated strong flares. This risk increased given recent activity from the complex region in the northeast.

Solar Wind / Geomagnetic Activity: A CME associated with the weak filament eruption on 01 Jan from the vicinity of AR3939 arrived at L1 around 04/0225 UTC. A fast wind from large coronal hole arrived around 04/1400UTC. Elevated to Strong solar winds of 550-690km/s are likely, declining only slowly into Days 2 and 3 (06-07 Jan).

Geomagnetic conditions are expected to be Unsettled to active during Day 1 (05 Jan), with a chance of further G1 Minor geomagnetic storm intervals. Activity is forecast to subside to generally Quiet to Unsettled levels into Days 2 and 3.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is likely to ease back from S1 Minor storm levels through the period.

Geomagnetic Storms

Geomagnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	Yes	40	15	10	1
Strong	G3	No	5	2	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	80	80	70	70
Very Active	R3-R5 (X Class)	Yes	25	25	25	25

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	Yes	80	30	20	10
Very Active	≥ S3 *	No	5	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = cm ⁻² sr ⁻¹ s ⁻¹)						